

Journal
of the
Royal Society of Western Australia

Vol. 50

Part 1

1.—The Clinidae of Western Australia (Teleostei, Blennioidea)

by N. E. Milward*

Manuscript received 15 February 1966; accepted 21 February 1967.

Abstract

A taxonomic review of the Western Australian fishes of the family Clinidae is given, together with notes on their distribution and biology. Keys to the genera, *Cristiceps* with two species and *Petraites* with five species, are included.

Introduction

The origin of the family Clinidae appears to have been in the seas of the New World (Hubbs 1952), with dispersal of representatives to the Australian region via South America and South Africa. The number of Australian species is small, mainly cool to temperate water forms. From Western Australia seven species are known, two of the genus *Cristiceps* Cuvier and Valenciennes, 1836, and five of *Petraites* Ogilby, 1885.

The papers of McCulloch (1908), Scott (1939, 1955), and Whitley (1945) provide taxonomic reviews and keys to some of the Australian species but there is virtually nothing in the literature on their biology. The purpose of this contribution is to review the Western Australian clinids, giving fuller descriptions of the species, information on their distribution, and notes on their biology.

This paper is based on part of studies of blennioid fishes carried out over a wide range of the Western Australian coastline, from the Monto Bello Islands (lat. 20° 30' S., long. 115° 25' E.) to Denmark (lat. 35° 0' S., long. 117° 5' E.). Extensive collections were made in the littoral and sub-littoral by poisoning, hand-netting, and trapping, but compared with other blennioids, e.g. blenniids and tripterygiids, the number of clinids taken was relatively few. Other specimens examined were a few received from Mr. R. J. McKay of the Fisheries Department (now of the Western Australian Museum), Dr. A. R. Main of the Zoology Department, University of Western Australia, and Dr. G. M. Storr of the Western Australian Museum, and those in the Western Australian Museum Collection, which was kindly made available for study by the Director, Dr. W. D. L. Ride.

Except for a few specimens placed in the Australian Museum, Sydney, almost all the material has been added to the collection at

the Western Australian Museum. In the listing of material examined collection localities and dates are given, together with catalogue numbers for specimens lodged either at the Western Australian Museum, without prefix or preceded by the letter P, or at the Australian Museum, preceded by the letters IB.

I wish to thank Dr. H. Waring, Professor of Zoology, University of Western Australia, in whose department the work was carried out as partial fulfillment for M.Sc. degree, and Dr. E. P. Hodgkin and Dr. A. R. Main for assistance during the study. The work was supported by a Research Grant from the University of Western Australia.

Australian Clinidae

All the Australian species belong to the subfamily Clininae as defined by Hubbs (1952).

They may be distinguished as blennioid fishes having moderately to very elongate, often laterally compressed, bodies; small and frequently inconspicuous cycloid scales; conical jaw teeth; gill-membranes united, free from isthmus; a small hook-like process on inner margin of pectoral girdle beneath the operculum; long dorsal fin of many spines and a few rays, the anterior spines often as a distinct crest which may or may not be connected to the following spine by membrane; pelvic fins jugular, of a spine, generally concealed, and two to four rays; all fin rays simple; and cirri generally present over anterior nares and orbits.

Previously the Clinidae has not been clearly delineated in the Australian literature. In check-lists McCulloch (1929) and Whitley (1948) have variously included within the family species referable to the Tripterygiidae. Marshall (1964) on Queensland fishes places under the name Clininae the tripterygiid species, while at the same time including the true clinids in the Blenniidae. The above diagnosis clearly excludes species of the Tripterygiidae and distinguishes clinids from the Blenniidae.

Three genera are represented in Australian waters: *Clinus* Cuvier, 1816, *Cristiceps* Cuvier and Valenciennes, 1836, and *Petraites* Ogilby,

* Zoology Department, University College of Townsville, Queensland.

1885. The genera *Heteroclinus* Castelnau, 1872, and *Neoblennius* Castelnau, 1875, have no validity (Waite 1923).

Lack of obvious, clear-cut morphological differences between *Clinus*, *Cristiceps*, and *Petraites* has caused taxonomic difficulties (McCulloch 1908; Scott 1955). The species of the three genera intergrade in many characters, *Petraites* being erected by Ogilby (1885), on a suggestion by Macleay (1882), to receive "those homeless fishes, which oscillate between the other two genera". The main character employed to separate the genera has been the degree of attachment by membrane of the third to the fourth dorsal fin spine. This in itself is a variable character but when taken in combination with other characters, namely the form of the supraorbital tentacles, numbers of dorsal fin spines and dorsal and pectoral fin rays, position of the first dorsal spine in relation to the eye, and the degree of membranous attachment of the last dorsal fin ray to the caudal peduncle, three distinct, seemingly natural, groups emerge and McCulloch's (1908) recommendation that the three genera should be retained is supported.

Key to Australian genera of Clinidae

- 1. First dorsal spine over or just in front of eye; membrane from last dorsal ray not extending to caudal fin; supra-orbital tentacles long, with narrow base *Cristiceps*
- First dorsal spine behind eye; membrane from last dorsal ray extending to caudal fin; supra-orbital tentacles short and rounded, or, if long, with broad base 2
- 2. (1) Third dorsal spine connected by membrane only to basal portion of fourth; 2nd dorsal fin with 31 or less spines *Petraites*
- Third dorsal spine connected by membrane to middle or upper half of fourth; 2nd dorsal fin with 32 or more spines *Clinus*

In Western Australian waters two genera are represented: *Cristiceps* with two species and *Petraites* with five species. The listing of *Clinus perspicillatus* Cuvier and Valenciennes, 1936, by Whitley (1948) appears to have resulted from a mis-identified specimen of *Petraites antinectes* (Gunther) in the Western Australian Museum collection and with this deletion *Clinus* remains unrecorded from this State.

Genus *Cristiceps* Cuvier and Valenciennes, 1836
Cristiceps Cuvier and Valenciennes, 1836, Hist. Nat. Poiss., xi, p.402—type by original designation
Cristiceps australis Cuv. and Val.

Key to Western Australian species of *Cristiceps*

- Inner ray of ventral fin much less than half length of middle ray; dorsal rays equally spaced *australis*
- Inner ray of ventral fin at least half length of middle ray; last two dorsal rays widely spaced from those preceding *aurantiacus*

***Cristiceps australis* Cuvier and Valenciennes, 1836**

Cristiceps australis Cuvier and Valenciennes, 1836, Hist. Nat. Poiss., xi, p.402.

Cristiceps axillaris Richardson, 1846, in Discoveries in Australia (Stokes), 1, p.486.
Christiceps splendens (sic) Castelnau, 1872, Proc. Zool. Acclim. Soc. Vict., 1, p.244.
Cristiceps howittii Castelnau, 1873, ibid., 2, p.48.
Cristiceps macleayi Castelnau, 1879, Proc. Linn. Soc. N.S.W., 3, p.385.
Cristiceps pallidus Macleay, 1882, Proc. Linn. Soc. N.S.W., 6, p.26.

Material examined. 22 specimens, varying in total length from 63 to 216 mm. Lancelin I. 7.iv.58; Cottesloe 10.vi.24 P879, 11.vii.27 P946; Rottnest I. 31.iii.56 P6182, 17.ix.56 P6185; Fremantle, offshore 3.ix.54 P3738; Garden I., offshore -vii.57; Coogee, south of Fremantle 26.vii.26 P921; Rockingham 4.v.18 P606; Peel Inlet 19.iv.44 P2611; Cape Bouvard, offshore 18.x.56 IB5161-3; Busselton 4.iv.38 P1867, 27.ii.53; Albany 27.iv.11 11279-80, -iv.11 12892-3, 6.viii.35 P1470, 30.ix.41 P2319, 26.iv.44 P2614.

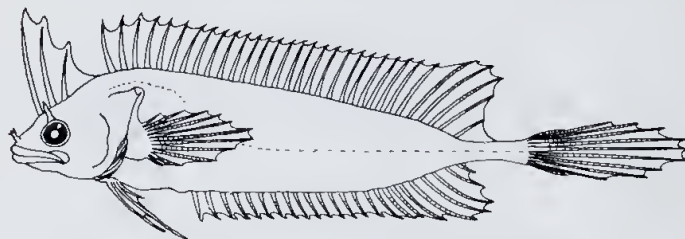


Figure 1.—*Cristiceps australis* Cuv. & Val., P6185, male, 94 mm, Rottnest I., 17.ix.56.

Description. Body moderately elongate, laterally compressed. Eyes large. Snout pointed. Lips reach almost to posterior margin of eye. Nasal tentacle a tubular pedicel palmately bearing a few short filaments. Supra-orbital tentacle long and slender, either simple with entire border or notched on inner and/or outer edge. High dorsal crest originating over eye, 1st and 2nd spines about equal in height, 3rd slightly more than half height of first two; each crest spine with soft extension which supports membrane above hard filaments. Membrane from 3rd spine generally just short of but may be joined to base of 4th spine. Margin of long dorsal fin fairly uniformly straight; soft extensions at the end of spines accentuate incisions in membrane between filaments; rays usually equally spaced, posterior ones shorter so that fin ends squarely; last ray completely united to about half-way along caudal peduncle by membrane. Anal fin spines about equal to anterior rays; rays increase in length posteriorly, 4th last the longest, final three decreasing in size making fin angularly pointed at end; base only of last ray joined to caudal peduncle. Pectoral fin extending beyond origin of anal fin in small specimens but short of it in large ones. Two outer rays of ventral fin long and free for most of their length, inner one short and much less than half length of middle ray. Caudal fin lanceolate, with stout inner rays and a short, slender one above and below. Lateral line a series of short tubes, arching over pectoral fin and continuing along mid-side to tail.

Colour in life. Very variable, bright green to brown and red. Marked with darker bands and silvery spots.

Colour in formalin. Body, head, and fins fairly uniform yellow-orange.

Fin counts. The numbers of spines and rays in the fins of the 22 specimens examined were D. iii, xxvi-xxviii, 5-8; A. ii, 22-26; P. 11; V. (i), 3; C. 9+2. (Counts from individual specimens of this and the other species are given in unpublished thesis, Milward (1962). Note: the spine in the ventral fin is reduced and concealed; the caudal fin is composed of nine fairly stout, inner rays and two weak, outer rays.)

The counts recorded, with only one exception, lie within the overall ranges given by McCulloch (1908) for 21 specimens from New South Wales, Victoria, and Western Australia, D. iii, xxvi-xxix, 6-8; A. ii, 24-26; V. 3; and for 7 specimens from New South Wales, South Australia, and Western Australia, D. iii, xxvi-xxviii, 6-7; A. ii,

22-24; V. 3. The single transgression, the count of 5 rays in the dorsal fin, was found in a specimen of 97 mm collected at Rottnest Island. Only one of the specimens examined had an anal fin ray count of 26, the remainder having 22-24 in agreement with the lower range given by McCulloch. Similarly, only one, the same specimen of 159 mm collected at Albany, had 8 rays, i.e. the upper limit, in the dorsal fin.

From McCulloch's paper it may be noted that his Western Australian specimens with the higher counts came from King George Sound (Albany), whereas those with the lower counts came from Fremantle. If the counts made in the present study are separated into those derived from specimens collected at Albany and those from specimens taken at other localities, differences between the two groups are also evident (see Table 1).

TABLE 1

Fin counts in Western Australian specimens of <i>C. australis</i>												
Specimens from:	2nd dorsal fin spines			2nd dorsal fin rays				Anal fin rays				
	26	27	28	5	6	7	8	22	23	24	25	26
Busselton and northwards	1	11	3	1	12	2	—	5	5	3	—	—
Albany	—	1	5	—	2	4	1	—	1	4	—	1

Comparisons by Student's *t* tests show that for each of the characters having variation (numbers of 2nd dorsal fin spines, 2nd dorsal fin rays, and anal fin rays) the differences are significant at the 1% level between counts for the two groups of specimens. The lower counts from the northern localities suggest the possible influence of higher temperatures during development (see Hubbs 1922, and Taning 1950, 1952) but both McCulloch's counts and the lack of differences between samples from the localities north of Busselton tend to negate this explanation. No other reasons can validly be suggested from the few specimens available and the observations made, so the underlying causes for the differences between the Albany and other specimens must for the present remain unexplained.

Distribution. Australia; Western Australia, South Australia, Tasmania, Victoria, New South Wales (McCulloch 1929), Queensland (specimens collected Moreton Bay, Dec. 1962—author). Lord Howe Island (Waite 1900). Northern coast of North Island, New Zealand (Hutton 1873).

***Cristiceps aurantiacus* Castelnau, 1879**

Cristiceps aurantiacus Castelnau, 1879, Proc. Linn. Soc. N.S.W., 3, p.386.

Cristiceps pictus Macleay, 1882, Proc. Linn. Soc. N.S.W., 6, p.25.

Material examined. 11 specimens, varying in total length from 45 to 244 mm. West Wallaby I., Houtman's Abrolhos 20.iv.29; Geraldton -x.09 10186, 25.iv.57 IB5165; Lancelin I., off-shore 23.i.58 P6180-1; Fremantle 21.iv.22 P801; Straggler's Reef, off Fremantle 24.v.59 P4447; Point Peron 11.ix.33 P1309, 26.x.36 P1706; Harvey Beach -vi.57 P6291; Unlocalised -iv.12.

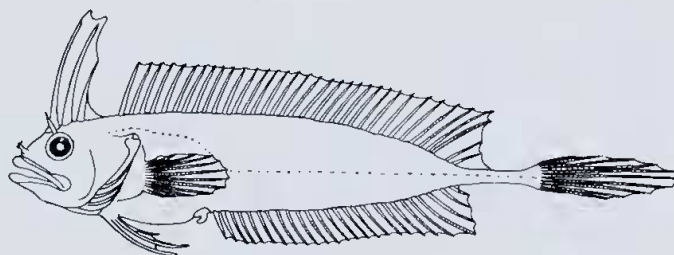


Figure 2.—*Cristiceps aurantiacus* Castelnau, P6181, male, 94 mm, Lancelin I., 23.i.58.

Description. Body moderately elongate, laterally compressed. Eyes large. Snout pointed. Lips reach to or slightly beyond posterior margin of eye. Nasal tentacle a tubular pedicel bearing a few simple filaments. Supra-orbital tentacle long and slender, tapering to a point, either simple with entire border or notched on inner or both edges. High dorsal crest originating just before or over anterior part of eye and enveloped in a thick, flabby membrane. Membrane from 3rd dorsal spine does not reach base of 4th. Margin of long dorsal fin fairly uniformly straight, cut square posteriorly; last two rays widely spaced from those preceding, with transparent membrane between; last ray entirely united to about half-way along caudal peduncle by membrane. Anal fin spines slightly shorter than 1st ray; rays increase in length posteriorly, 4th last the longest, final three decreasing in size making fin angularly pointed at end; last ray only basally connected to peduncle by membrane. Pectoral fin extending to just beyond origin of anal fin or some distance short of it. Ventral fin of a concealed spine and three rays, outer two longest, inner at least half length of middle one; rays broadly

webbed by thick membrane. Caudal fin lanceolate, with stout inner rays and a short, slender one above and below. Lateral line a series of tubes commencing over operculum, extending a short distance almost horizontally and then dropping obliquely to mid-line, whence it continues to tail.

Colour in life. Not handled alive. Marshall (1964) gives the following description: "Colour a beautiful clear orange-yellow, with the fins yellow; there are 4 almost vertical hyaline patches on the second dorsal, the first about the seventh and eighth spines, another about the thirteenth and fourteenth, another about the twentieth and twenty-first and the last on the two last short rays. Some examples are reddish with the fins dark purple, with minute blackish dots and pectorals and ventral fins barred with yellow."

Colour in formalin. Body, head, and fins a fairly uniform whitish to yellow-orange colour. A darker orange streak passing through eye and over cheek, just behind angle of lip, in some specimens.

Colour in alcohol. A specimen initially preserved in methylated spirits profusely spotted with brown dots over entire head, body, and fins against a yellow background. Brown streak present from supra-orbital tentacle through eye and down cheek.

Fin counts. The numbers of spines and rays in the fins of the 11 specimens examined were D. iii, xxix-xxxi, 4-5+2; A. ii, 23-25; P. 11; V. (i), 3; C. 9+2.

These counts agree closely with those given by McCulloch (1908) with the exception of the thirty-one rays in the 2nd dorsal fin, which is higher than hitherto recorded. This higher count was found in 3 specimens of 45 mm from offshore, Lancelin Island, 180 mm from Straggler's Reef, off Fremantle, and 244 mm from Point Peron.

Distribution. Australia: Western Australia (Whitley 1945), New South Wales (McCulloch 1929). Lord Howe Island (Ogilby 1889). North-east coast of North Island, New Zealand (Griffin 1926).

Genus **PETRAITES** Ogilby, 1885

Petraites Ogilby, 1885, Proc. Linn. Soc. N.S.W. 10, p.225—type by original designation *Petraites heptacolus* Ogilby.

Key to Western Australian species of *Petraites*

- | | | | | |
|--------|--|------|------|---------------------|
| 1. | Ventral fin with two rays; dorsal fin with two rays | .... | .... | <i>nasutus</i> |
| | Ventral fin with three rays; dorsal fin with three or four rays | .... | .... | 2 |
| 2. (1) | Three rays of ventral fin approximately equal, supra-orbital tentacle with long outer filament | .... | .... | <i>equiradiatus</i> |
| | Three rays of ventral fin unequal, outer two longer and stouter than inner one; supra-orbital tentacle without a long filament | .... | .... | 3 |
| 3. (2) | 1st and 2nd dorsal fin rays with a wide space between | .... | .... | <i>heptaeolus</i> |
| | Dorsal fin rays more or less equally spaced, 1st and 2nd not widely separated | .... | .... | 4 |
| 4. (3) | Dorsal fin with 3 + 29-31 spines and 3 (occasionally 4) rays | .... | .... | <i>antinectes</i> |
| | Dorsal fin with 3 + 25-27 spines and 4 (occasionally 3) rays | .... | .... | <i>roseus</i> |

Note. The construction of a workable, yet simple, key to the *Petraites* spp. is extremely difficult. Use of body proportions, e.g. deep or slender, as employed by McCulloch (1908), has limitations due to the allometric growth of the species. Diagnosis by means of differences in fin counts is not wholly satisfactory either, because of the possibility of undiscovered variation, but from the material examined the constancy of the differences used in the above key indicates that they will be reliable for most, if not all, specimens.

Petraites nasutus (Gunther), 1861

Cristiceps nasutus Gunther, 1861, Cat. Fish. Brit. Mus., iii, p.273.

Cristiceps fasciatus Macleay, 1882, Proc. Linn. Soc. N.S.W., 6, p.19.

Clinus whiteleggii Ogilby, 1894, Proc. Linn. Soc. N.S.W., (2), 9, p.371.

Petraites fasciatus; McCulloch, 1908, Rec. Aust. Mus., 7, p.42.

Petraites nasutus; Whitley, 1941, Aust. Zool., 10, p.38.

Material examined. One specimen measuring 49mm total length. Rottneest I. 21.i.54 P6763.

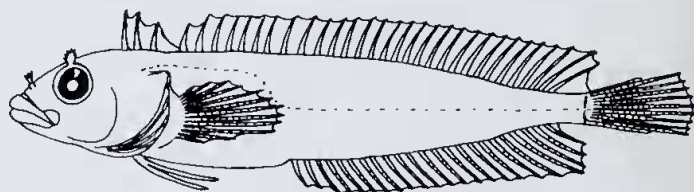


Figure 3.—*Petraites nasutus* (Gunther), P6763, female, 49 mm, Rottneest I., 21.i.54.

Description. Moderately elongate, rather slender body. Large eyes. Snout pointed. Lips not reaching posterior margin of eye. Nasal cirrus trifold, on a short tubular pedicel. Supra-orbital tentacle a broad, flat flap with irregular filaments around margin. First three dorsal spines separated as a crest but no higher than remainder of fin; 1st spine just behind vertical from pre-opercular margin; membrane from 3rd spine connected to base of 4th. Dorsal fin spines long, increasing slightly in length posteriorly so that fin border more or less horizontal; 2nd ray shorter than 1st and entirely connected to whole of caudal peduncle by membrane. Two anal spines shorter than rays, which are longest posteriorly; last ray connected to only about a third of peduncle. Pectoral fin rounded, not quite reaching origin of anal fin. Ventral fin of a concealed spine and two slender rays. Caudal fin sub-truncate. Lateral line a series of tubes commencing over operculum, running parallel to back for a short distance, but not as far as vent, then dropping obliquely to mid-line whence it continues to tail.

Colour in life. McCulloch (1908), for New South Wales specimens, states "In colour it may be anything from dark green without markings to pale green with darker bands and silvery or transparent markings. Specimens living in the pink coralline sea-weed common on the coast are of a bright pink variegated with brown, throughout which, however, the typical bands and silver spots are retained."

Colour in formalin. Body uniformly yellow, fins hyaline.

Fin counts. The counts made on the single Western Australian specimen were D. iii, xxviii, 2; A. ii, 21; P. 12; V. (i), 2; C. 11 (9+2).

These counts are within the ranges given by McCulloch (1908).

Distribution. Australia: New South Wales (McCulloch 1929), southern Queensland (Whitley 1941), Western Australia.

This is the first record for Western Australia.

***Petraites equiradiatus* Milward, 1960**

Petraites equiradiatus Milward, 1960, West. Aust. Nat., 7, no. 5, p.134.

Material examined. 4 specimens, 73, 74, 83 and 97 mm in total length. Rottneest I, -ii.57 P4472 IB5164, 10.iii.61 P4973 (2).

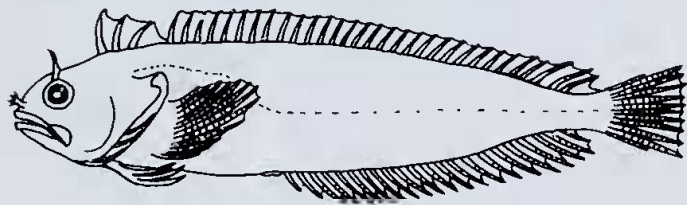


Figure 4.—*Petraites equiradiatus* Milward, P4472, male, 97 mm, Rottneest I., -ii.57.

Description. Body fairly elongate. Snout rounded. Nasal cirrus multifid, with 8 or 9 filaments. Supra-orbital tentacle with a long, tapering outer filament and one or two short inner ones, all broadly joined at base. First three dorsal spines about equal in length, very slightly longer than those following from which they are separated by a gap approximately equal to 3rd spine when depressed; 1st spine just before vertical from margin of pre-operculum; 3rd spine joined by membrane to basal portion of 4th, which is placed over hind border of operculum. First and 2nd dorsal rays more widely spaced than 2nd and 3rd; 3rd ray entirely connected to whole of caudal peduncle by membrane. Anal fin commences beneath 12th dorsal spine. First anal spine about two-thirds length of 2nd; rays increasing very slightly in length to penultimate, the last shorter and connected only basally to peduncle by membrane. Pectoral fin rounded. Ventral fin with a concealed spine and three similar finger-like rays; middle ray a fraction longer than other two, reaching approximately half-way to vent. Caudal fin truncate. Lateral line distinct anteriorly as a series of closely-set tubed scales extending over about two-thirds of the pectoral fin, the series then descending to mid-line and continuing to tail, becoming more widely spaced and less obvious.

Colour in life: Not seen alive.

Colour in formalin. Fairly uniform yellow, except for paler abdomen. Faintest suggestion of seven darker yellow bands on upper sides.

Colour in alcohol. Ground colour yellow-orange. Seven darker, orange-brown, irregular bars on body. Dark brown spots on body, mainly bordering bars. In one specimen lighter bars between the more pronounced ones and a few

spots on the head. All fins hyaline, except for slight brown colouring of membrane basally in dorsal fin above body bars.

Fin counts. The numbers of spines and rays in the 4 specimens examined were D. iii, xxviii-xxix, 3; A. ii, 20-21; P. 12; V. (i), 3; C. 9+2.

Distribution. Known only from Rottneest Island, Western Australia.

***Petraites heptaeolus* Ogilby, 1885**

Petraites heptaeolus Ogilby, 1885, Proc. Linn. Soc. N.S.W., 10, p.225.

Cristiceps wilsoni Lucas, 1891, Proc. Roy. Soc. Vict., (n.s.), iii, p.10.

Material examined. 5 specimens, varying in total length from 44 to 81 mm. Triggs I. 3.iii.56 P6202; Rottneest I. 6.xii.35 P1504-5, 20.iii.58 P6200, 1.iv.56 IB5151.

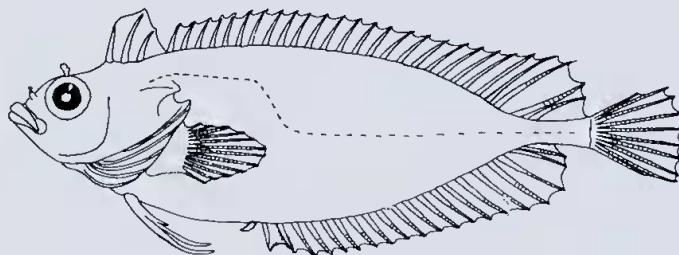


Figure 5.—*Petraites heptaeolus* Ogilby, P6200, male, 70 mm, Rottneest I., 20.iii.58.

Description. Body moderately elongate, laterally compressed. Eyes large, diameter greater than length of pointed snout. Nasal tentacle a short, tubular pedicel bearing a small, ovate cirrus. Supra-orbital tentacle a short, rounded flap. First dorsal spine over pre-opercular margin, forming with 2nd and 3rd a crest slightly higher than remainder of fin; membrane from 3rd spine reaching to base of 4th. Margin of long dorsal fin more or less horizontal, last spine about twice length of anterior ones; 1st ray longer than last spine and widely separated from 2nd ray by clear membrane; 2nd and 3rd rays close together, 3rd joined entirely to whole of caudal peduncle by membrane. Two anal spines stout and shorter than rays, which are equally spaced and increase slightly in length to third last, which is more widely separated from the shorter last two. Pectoral fin rounded, barely or not reaching origin of anal fin. Ventral fin of a concealed spine, two long rays the outer longer, and a short inner ray. Caudal fin sub-truncate, with stout inner rays, and a short, slender one above and below. Lateral line a series of tubed scales, commencing above operculum and running horizontally to just before vertical from vent, where it drops obliquely to mid-line and continues to tail.

Colour in life. Not seen alive. Scott (1962), for South Australian specimens, says "Colour bright olive-green above, lighter below. About seven broken dark bars on the side, extending on to the dorsal fin. Operculum and under parts of head pinkish. Some specimens with a small silver spot behind the eye."

Colour in formalin. Fairly uniform yellow to brown colour.

Fin counts. The numbers of fin spines and rays in the 5 specimens examined were D. iii, xxiv, 1+2; A. ii, 17-18; P. 12; V. (i), 3; C. 8+2.

The counts lie within the ranges, but at the lower extremes, of those given by McCulloch (1908) for New South Wales and Victorian specimens, D. iii, xxiv-xxviii, 1+2; A. ii, 17-21. Scott (1965), for two Tasmanian specimens, gives a pectoral fin ray count of 11 but each of the Western Australian specimens had 12, in agreement with the type description by Ogilby (1885). The suggestion by Scott that the original description giving V. i, 3 was in error, seems to be incorrect, since dissection of Western Australian specimens has shown the spine to be present, although much reduced and concealed.

Distribution. Australia: New South Wales, Victoria (McCulloch 1929), Tasmania (Scott 1965), Western Australia.

Although one specimen was collected at Rottneest Island on December 6, 1935, this is the first published record for the State.

***Petraites antinectes* (Gunther), 1861**

Cristiceps antinectes Gunther, 1861, Cat. Fish. Brit. Mus., iii, pp.273 and 562.

Cristiceps phillipi Lucas, 1891, Proc. Roy. Soc. Vict., (n.s.), iii, p.11.

Petraites antinectes; McCulloch, 1929, Mem. Aust. Mus., 5, p.349.

Material examined. 15 specimens, varying in total length from 33 to 86 mm. Triggs I. 13.iii.56 P6193, 25.xi.57 P6764; North Beach 22.vi.37 P1790; Rottneest I. 18.i.54 P10096(2), 19.i.54 P6194, 21.i.54 P6762, 16.ix.56 P6192, 6.iv.58 P6195-8; Leighton 20.i.56; Cowaramup Bay 11.xi.56 P10382; Cape Leeuwin 30.iii.59 P4467.

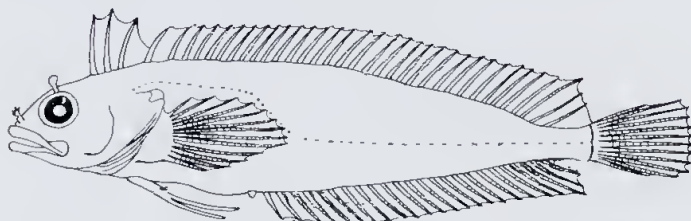


Figure 6.—*Petraites antinectes* (Gunther), P6197, male, 68 mm, Rottneest I., 6.iv.58.

Description. Body fairly elongate. Eyes large. Snout pointed. Lips reach to posterior margin of eye. Nasal cirrus a few short filaments borne palmately on a short, tubular pedicel. Supra-orbital tentacle short and rounded, often with irregular margin. First three spines of dorsal fin form a crest, slightly higher than remainder of fin; 1st spine just in front of vertical from pre-opercular margin; membrane in crest extends slightly beyond spines and from 3rd spine to part-way up 4th. Margin of long dorsal fairly uniformly straight; rays equally spaced, last entirely connected to whole of caudal peduncle by membrane. Anal spines shorter than rays, which are longest posteriorly; last ray joined only basally to peduncle by membrane. Pectoral fin extends to or just beyond origin of anal fin. Ventral fin of a

concealed spine, two slender outer rays, the median longer, free for about half their length, and a short inner ray. Caudal fin sub-truncate, with stout inner rays and a short slender one above and below. Lateral line a series of tubes, commencing over operculum and extending roughly parallel to back for a short distance, then approximately over the vent dropping obliquely to mid-line, whence it continues to tail.

Colour in life. Extremely ornate. The ground colour and more intense markings of spots and bars very variable, from light brown to greenish brown and purple. A series of six or seven vertical bars on the body. These bars are widest dorsally and extend onto dorsal fin. They are connected by a horizontal band along the mid-line in some specimens and are edged with thin white lines, that are continuous dorsally but broken ventrally. Paler areas lie between the bars, with silvery spots just below mid-line in most specimens. A 'hammer shaped' marking on caudal peduncle. Abdominal area white, and white spots on lower parts of head and jugular region. A dark spot before eye and a larger one behind it. First three dorsal spines in crest may be dark, with markings extending from them onto head. Long dorsal fin has, in addition to extensions of body bars, spots forming faint horizontal or slightly oblique stripes. Anal fin with a series of spots or bars, each alternate one adjacent to a bar on body. Dark spots on pectorals form lines when rays closed together. Similarly spots form vertical bands on caudal fin. Dark spots also present on ventral fin rays.

Colour in formalin. Bright yellow-orange or brown. The fasciated pattern of life only just evident in most specimens as slightly darker markings on sides of body, and on dorsal and anal fins.

Fin counts. The counts from the 15 specimens examined were D. iii, xxix-xxxi, 3-4; A. ii, 21-22; P. 13; V. (i), 3; C. 10+2. (Note: one specimen had 11 and another 14 rays in the left pectoral fin but both had the usual 13 in the right fin.)

Gunther (1861) initially diagnosed *antinectes* as a variety of *Cristiceps argentatus* Risso, on the grounds of the Australian specimens having a higher anal fin count, ii, 23, than the European and African individuals of the species. Macleay (1882) listed *antinectes* from Western Australia giving the counts D. iii, xxx, 4; A. ii, 23; V. i, 2, but these were almost certainly, together with the description, taken from Gunther's catalogue and not from new material. Whitley (1945) examined the Australian specimens in the British Museum collection and selected a lecto-type of *antinectes* having D. iii, xxix, 4; A. ii, 23.

The lower anal fin counts of the specimens now reported upon, five of ii, 21, ten of ii, 22, are, therefore, of note and make it questionable whether Gunther would have recognised a different variety if this material had been available to him. It is further to be noted that Smith (1945, 1953) does not record *argentatus* from South Africa and as the Mediterranean is outside the otherwise known limits of these

fishes, and Whitley does not mention having seen European specimens, the author queries whether or not Risso's material might not have been of Australian origin. If this should prove to be the case *antinctes* would be synonymous with *argentatus*.

Counts recorded under *phillipi* from Victoria and Tasmania by Lucas (1891), McCulloch (1908), and Scott (1966) lie within the ranges D. iii, xxx-xxxii, 2-3; A. ii, 22-25. The differences between these and the counts from Western Australian specimens may be attributed to geographical variation, the author concurring with Whitley (1945) on *phillipi* being synonymous with *antinctes*. Scott (1966) also gives different pectoral and caudal fin ray counts, each of 11, for three Tasmanian specimens.

The ventral fin count, when recorded, has invariably been given as i, 2 or 2. In the Western Australian specimens the inner ray is very small compared with the long, outer ones and it is possible that it has been overlooked or not recorded by other workers.

Petraites roseus (Gunther), 1861

Cristiceps roseus Gunther, 1861, Cat. Fish. Brit. Mus., iii, p.274.

Petraites roseus; Waite, 1904, Rec. Aust. Mus., 5, pp.181 and 224.

Petraites sellularius Whitley, 1931, Aust. Zool., 6, p.323.

Note on synonymy. Gunther described the species from the coasts of Australia and New Guinea but the latter locality is extremely unlikely from our knowledge of the distribution of the genus. Whitley (1931) separates the New South Wales and Lord Howe Island forms from *P. roseus*, since they differ from Gunther's description in having the height $4\frac{1}{2}$ in total length (Gunther: 5) and eye longer than the snout (Gunther: equal). The allometric growth of these fishes, however, makes these poor diagnostic characters. An examination of Western Australian specimens has revealed much variation in these and other proportions depending on the size of the fish.

Material examined. 9 specimens, varying in total length from 31 to 145 mm. Lancelin I. 23.i.58, 7.iv.58; Rottneest I. 18.i.54 P10094, 20.iii.58 P6199, 23.viii.58 IB5200; Cottesloe 24.vii.23 P885-6; Cowaramup Bay 11.xi.56 P10381; Walpole Inlet 9.vii.49 P3257.

Description. Body moderately elongate, laterally compressed and increasing in depth with growth. Eyes large. Snout pointed. Lips extending to or just beyond posterior margin of eye. Nasal cirrus a few short filaments borne on a short, tubular pedicel. Supraorbital tentacle about equal to diameter of eye in height, with outer border entire but top and inner side dissected forming an irregularly

TABLE 2
Reproductive condition of females

	Month Collected	Locality	Ovarian Contents	
			Oocytes or Eggs with No Visible Development	Developing Embryos
<i>C. australis</i>				
1. 104 mm	April	Albany	+	—
2. 166 mm	April	Albany	+	+
3. 191 mm	May	Rockingham	+	+
4. 137 mm	July	Coogee	+	+
5. 148 mm	July	Cottesloe	+	—
6. 161 mm	August	Albany	+	+
7. 216 mm	September	Albany	+	+
8. 133 mm	October	Cape Bouvard	+	+
9. 136 mm	October	Cape Bouvard	+	+
10. 143 mm	October	Cape Bouvard	+	+
<i>C. aurantiacus</i>				
1. 161 mm	April	Geraldton	+	—
2. 208 mm	September	Point Peron	+	+
3. 210 mm	October	Geraldton	+	+
4. 244 mm	October	Point Peron	+	+
<i>P. nasutus</i>				
1. 49 mm	January	Rottneest I.	+	+
<i>P. heptaeolus</i>				
1. 81 mm	March	Triggs I.	+	—
<i>P. antinctes</i>				
1. 86 mm	January	Rottneest I.	+	+
2. 60 mm	January	Rottneest I.	+	+
3. 48 mm	April	Rottneest I.	+	+
4. 43 mm	November	Cowaramup Bay	+	—
<i>P. roseus</i>				
1. 116 mm	August	Rottneest I.	+	+

+ = present

— = absent

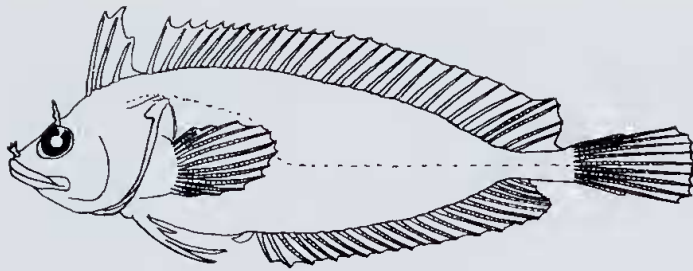


Figure 7.—*Petraitis roseus* (Gunther), P6199, male, 78 mm, Rottneest I., 20.iii.58.

lobate margin. First dorsal fin spine just behind eye, forming with 2nd and 3rd a crest higher than remainder of fin; membrane of crest produced beyond spines; membrane from 3rd spine just reaches base of 4th. Spines of long dorsal fin increase in length posteriorly; rays irregularly spaced, last entirely connected to whole of caudal peduncle by membrane. Anal spines shorter than rays, which are longest posteriorly; membrane from last ray united to about halfway along peduncle. Pectoral fin rounded, extending to or just beyond origin of anal fin. Ventral fin of a concealed spine, two long, sub-equal, stout rays and a short, slender inner one. Caudal fin sub-truncate, with strong inner rays and a shorter, slender one above and below.

Colour in life (of specimen 31 mm long, from Cowaramup Bay). Uniformly dark brown over all body and head. A distinctive gold speck just behind eye. Two sections of clear membrane at posterior end of dorsal fin.

Colour in formalin. Fairly uniform yellow-orange. Suggestion of darker orange bars on body, dorsal and anal fins, and rows of orange spots on caudal fin rays in some specimens.

Fin counts. The numbers of fin spines and rays in the 9 specimens examined were D. iii, xxv-xxvii, 3-4; A. ii, 19-21; P. 12; V. (i), 3; C. 9+2.

These counts lie within the ranges given by Macleay (1882) and McCulloch (1908) for New South Wales and Lord Howe Island specimens, with the exception of the count of 27 spines in the 2nd dorsal fin, which was present in 2 specimens, one of 130 mm from Rottneest Island and one of 31 mm from Cowaramup Bay.

Distribution. Australia: Western Australia, New South Wales (McCulloch, 1929), Queensland (Marshall, 1957). Lord Howe Island (Ogilby, 1889).

Notes on Biology

Habitats and habits. *Cristiceps australis* and *C. aurantiacus* are known mainly from sea-grass beds. These sea-grasses, of the genera *Posidonia*, *Cymodocea*, *Zostera*, and *Halophila*, form extensive beds along much of the coastline, where sand deposits are fairly fixed and stable.

Both species range from the sea-grass beds in shallow waters close inshore into waters at some depth. *C. aurantiacus* extends at least to seventeen fathoms, two specimens having been taken at this depth in a crayfish-pot.

All the specimens of *Petraitis* were collected from close inshore in shallow water, with one exception, a *P. roseus*, which was from a crayfish-

pot at seventeen fathoms. North of Cape Naturaliste most were found on aeolianite erosion platforms. South of this point they occur also on igneous rock benches.

Both *Cristiceps* species swim freely away from the bottom but are also able to move in contact with the substratum, employing the pelvic fin rays in the manner of walking legs. Their coloration and the slow undulatory movements of body and fins when swimming make them extremely difficult to detect amongst the sea-grass fronds.

The available evidence suggests that in the daytime the inshore individuals of the *Petraitis* species remain relatively dormant, hidden amongst algae and in pools on the platforms, and possibly also in the deeper sub-littoral, becoming more active and feeding during darkness.

Food. Analyses of stomach and intestinal contents indicate that the *Cristiceps* spp. and *P. antinectes* and *P. equiradiatus* are carnivorous. Specimens of the other *Petraitis* spp. examined contained no food.

Cristiceps specimens contained crustaceans, mainly amphipods, and fishes. Their ability to take large food was shown by a specimen of *C. aurantiacus*, measuring 210 mm, which contained a semi-digested piece of fish (only the tail from the anal origin backwards) 43 mm in length and with vertebral spines 11 mm long.

Crustaceans appear to be the principal food of *P. antinectes* and *P. equiradiatus*, the specimens examined containing large numbers of these but no other organisms.

Reproduction. All the Western Australian clinids are ovo-viviparous, development of the embryos occurring within the ovarian cavity. Males possess a tapered, forwardly curved, genital phallus.

The ovaries of female specimens were examined to determine the presence or absence of embryos. The results are given in Table II. From the table it may be seen that breeding appears to take place during most months of the year. Certainly there is no restricted period during which all the fishes carry and produce the young. In this the Western Australian species differ from those in South Africa, where, according to the statement by Smith (1958)—“large numbers of young being born August-October”—there is a definite breeding season.

It has also been discovered that in some at least of the Australian species, viz. *Cristiceps australis*, *Petraitis nasutus*, *P. antinectes*, more than one brood of embryos may develop simultaneously within the ovaries. Thus, in addition to the various sized oocytes normally present, there can be one or more distinct groups of embryos. In one specimen of *C. australis* examined from Moreton Bay, Queensland, and measuring 156 mm, four broods at clearly separated stages of development were present. This occurrence of multiple broods, i.e. superfoetation, the term used by Turner (1937) in reference to poeciliid fishes, has not previously been recorded in the Blennioidea and is being further investigated.

From the evolutionary view-point it is to be noted that all the American clinids are oviparous. Ovo-viviparity originated within the family following dispersal of representatives to the South African region. In the Australian forms the trend has progressed further, with an apparent lengthening of the breeding season and the development of superfoetation.

References

- Griffin, L. T. (1926).—Descriptions of New Zealand fishes. *Trans. N.Z. Inst.* 56: 538-546.
- Gunther, A. (1861).—"Catalogue of the Acanthopterygian Fishes in the Collection of the British Museum. Vol. III." (British Museum: London.)
- Hubbs, C. L. (1922).—Variation in the number of vertebrae and other meristic characters of fishes correlated with temperature of water during development. *Amer. Nat.* 56: 306-372.
- Hubbs, C. (1952).—A contribution to the classification of the blennioid fishes of the family Clinidae, with a partial revision of the eastern Pacific forms. *Stanford Ichth. Bull.* 4: 41-165.
- Hutton, F. W. (1873).—Contributions to the ichthyology of New Zealand. *Trans. N.Z. Inst.* 5: 259-272.
- Lucas, A. H. (1891).—On the occurrence of certain fish in Victorian Seas, with descriptions of some new species. *Proc. Roy. Soc. Vic., (n.s.)*, 3: 8-14.
- Macleay, W. (1882).—Descriptive catalogue of the fishes of Australia. Part III. *Proc. Linn. Soc. N.S.W.* 6: 1-138.
- Marshall, T. C. (1957).—Ichthyological notes. *Ichth. notes Dept. Harb. Mar. Qld.* 1, no. 3: 117-137.
- (1964).—"Fishes of the Great Barrier Reef and Coastal Waters of Queensland". (Angus and Robertson: Sydney.)
- McCulloch, A. R. (1908).—Studies in Australian fishes. No. 1. *Rec. Aust. Mus.* 7: 36-43.
- (1929).—A check-list of the fishes recorded from Australia. Part III. *Aust. Mus. Mem.* 5: 329-436.
- Milward, N. E. (1962).—"The systematics and biology of Western Australian species of the teleost families Blenniidae, Tripterygiidae and Clinidae". (Unpublished thesis, University of Western Australia).
- Ogilby, J. D. (1885).—Descriptions of new fishes from Port Jackson. *Proc. Linn. Soc. N.S.W.* 10: 225-230.
- (1889).—The reptiles and fishes of Lord Howe Island. *Aust. Mus. Mem.* 2: 51-74.
- Scott, E. O. G. (1939).—Observations on some Tasmanian fishes. Part IV. *Pap. & Proc. Roy. Soc. Tasm.* 1938: 139-159.
- (1955).—Observations on some Tasmanian fishes. Part VII. *Pap. & Proc. Roy. Soc. Tasm.* 89: 131-146.
- (1965).—Observations on some Tasmanian fishes. Part XIII. *Pap. & Proc. Roy. Soc. Tasm.* 99: 53-65.
- (1966).—Observations on some Tasmanian fishes. Part XIV. *Pap. & Proc. Roy. Soc. Tasm.* 100: 93-115.
- Scott, T. D. (1962).—"The marine and fresh water fishes of South Australia." (Govt. Printer: Adelaide.)
- Smith, J. L. B. (1945).—The fishes of the family Clinidae in South Africa. *Ann. Mag. Nat. Hist.*, (11), 12: 535-546.
- (1953).—"The Sea Fishes of Southern Africa." (Central News Agency Ltd.: South Africa.)
- Taning, A. V. (1950).—Influence of the environment on number of vertebrae in teleostean fishes. *Nature* 165, no. 4184: 28.
- (1952).—Experimental study of meristic characters in fishes. *Biol. Rev.* 27: 169-193.
- Turner, C. L. (1937).—Reproductive cycles and superfoetation in poeciliid fishes. *Biol. Bull.* 72: 145-164.
- Waite, E. R. (1900).—Additions to the fish fauna of Lord Howe Island. *Rec. Aust. Mus.* 3: 193-209.
- (1923).—"The fishes of South Australia". (Govt. Printer: Adelaide.)
- Whitley, G. P. (1931).—New Names for Australian fishes. *Aust. Zool.* 6: 310-334.
- (1941).—Ichthyological notes and illustrations. *Aust. Zool.* 10: 1-50.
- (1945).—New sharks and fishes from Western Australia. Part 2. *Aust. Zool.* 11: 1-42.
- (1948).—A list of the fishes of Western Australia. *W.A. Fish. Dept. Bull.* 2: 1-35.